AMI

Ultrasonic Flowmeter: Installation and User Manual

Table of Contents

Kit Includes:

       1 – AMI Enclosure

       1 – Ultrasonic Flowmeter

       2 – Transducers (4' cable)

       2 – 4" Clamps

       2 – 6" Clamps (Join together w/4" if using on larger pipe)

       1 – Tube synthetic grease

Section 1: Getting Started

Please read through this entire section before installing your Ultrasonic Flowmeter for the first time.

1.1 Things to know

- **All setup parameter data is stored temporarily in RAM. To make changes permanent, you must save your changes in menu Screen 26. Any changes not stored by this method will be lost upon device reboot.**

- To obtain the most accurate readings, device must first be calibrated with zero flow through the pipe (zero point). This reading can be set as the zero point in Menu Screen 42 (M42).

- The size of the pipe will determine the best transducer mounting method. Refer to section 3 for best mounting methods.

- It is recommended to fill out the form in section 2 prior to bringing the unit to the field to be installed. You can also preset the information into the device prior to installing to save time.

- **All setup parameter data is stored temporarily in RAM. To make changes permanent, you must save your changes in menu Screen 26. Any changes not stored by this method will be lost upon device reboot.**

1.2 Transducer site requirements

The following conditions must be met to have valid and usable data from the Ultrasonic Flowmeter. If any or all of the conditions do not meet the requirements, the meter will not function properly.

- Pipe must be full of liquids at time of reading

- No heavy corrosion or deposition inside of pipe

- Must be in safe and secure location

- As a general rule, the pipe must not be shorter than 15xdiameter. Insufficient straight pipe length will degrade the accuracy.

- The mounting site for the transducers should be 10D upstream and 5D downstream

- If there are flow disturbing parts (such as pumps, valves, etc) upstream, the straight pipe length should be increased
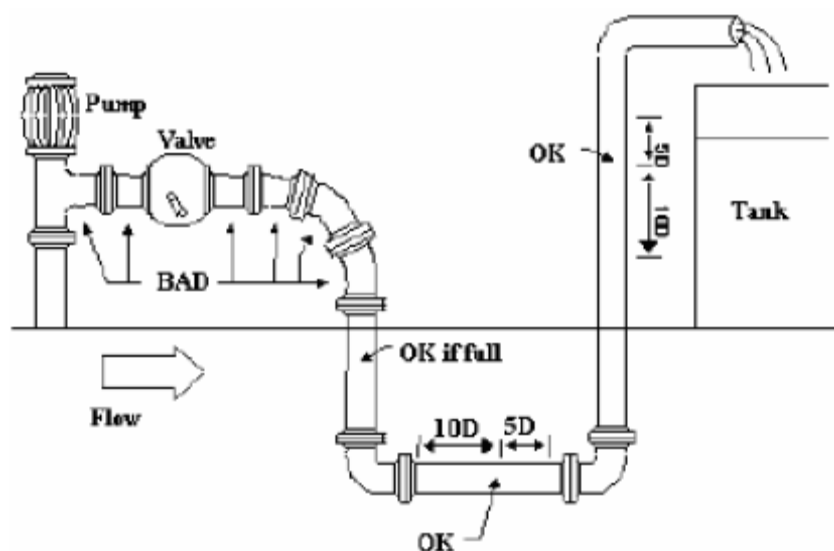
Piping Configuration and Transducer Position	Upstream Dimension L up x Diameters	Downstream Dimension L dn x Diameters
	10D	5D
	10D	5D
	10D	5D
	12D	5D
	20D	5D
	20D	5D
	30D	5D

1.3 Using the keys

MENU – used for entering into various menu windows

Page up – used for advancing menu windows, and for adding digits

Page down – use to move cursor into next digit position

ENT Enter – use to enter selection

Example – to enter menu window 26, the user would press:

MENU x1   ▲ x 2   ► x 1   ▲ x6   ENT x1

Section 2: Mounting the Transducers

The transducers can be attached using three different methods:

2.1 Choose mounting method
The size of the pipe will determine the best method to mount your transducers. Generally, for pipes over 4" you want to use the Z-Method

2.2 Preparing pipe surface
The pipe surface where the transducers will be mounted should be clean and free from any rust, paint and moisture. A dry, clean surface will ensure a good acoustic bond between transducers and the pipe.

2.3 Preparing the transducer
Clean and dry the transducer contact surface. Apply synthetic grease on transducer where it will contact the pipe. Do not apply more grease than necessary, especially on smaller pipes.

If installing on a horizontal pipe, the transducers should be mounted on the sides of the pipe to minimize air bubbles interfering with the signal quality!

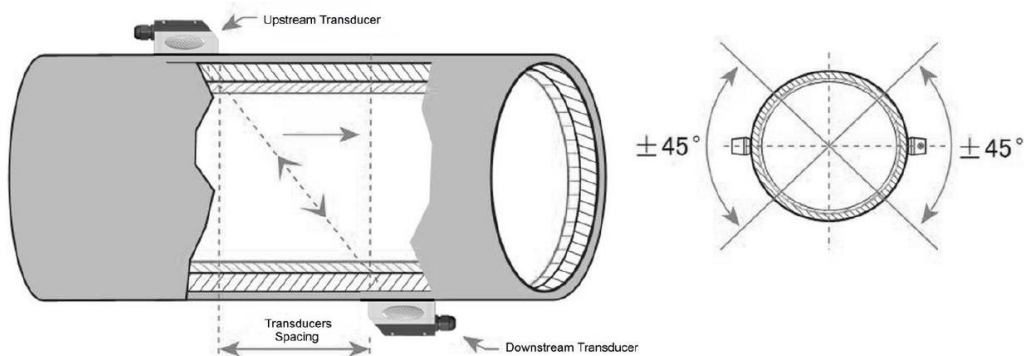## V-Method Installation

The V-Method is most commonly used for pipe diameters ranging from ¾" to 8" and is also referred to as Reflective Mode.
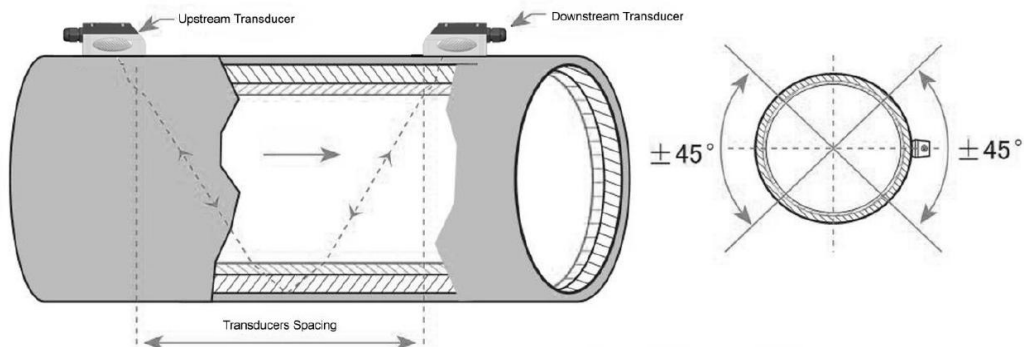
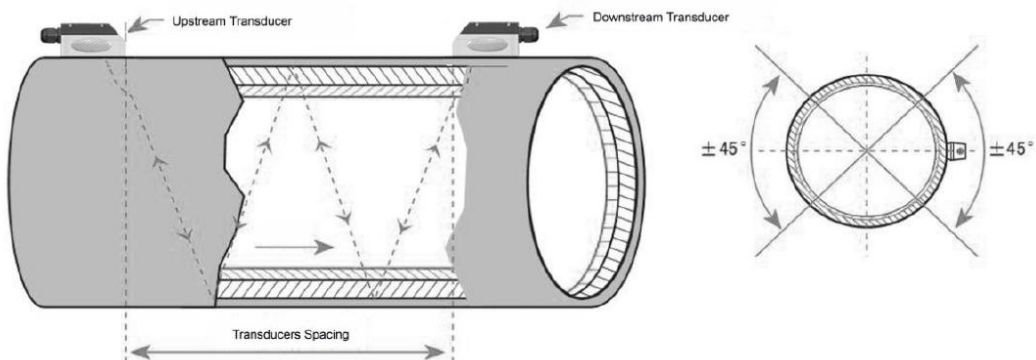## Z-Method Installation

The Z-Method can be used for pipe sized ranging from 4" to 23 ½". We recommend using the Z method when the pipe is 4" or greater.

W- Method Installation

The W-Method is most widely used on smaller pipes, ½" to 1 ¾" in size.

Section 3: Necessary Measurements

The following sheet contains the basic information necessary to setup your Ultrasonic Flowmeter. It is recommended the user fills out completely as much information ahead of time as possible. You can either fill out this form, or enter the necessary data directly into the flow meter.

Parameter	Menu Screen	Note
Pipe Outer Diameter	11	
Pipe Wall Thickness	12	
Pipe Inner Diameter	13	
Pipe Materials*	14	
Liner Material and its sound speed and thickness (if any)	16	
Liquid type*	20	
Transducer type connected to flow meter	23	Clamp on L2
Transducer mounting method (See section 2)	24	
Transducer spacing (Will be displayed in screen 24)	25	
Measurements in Units	30	Set to English
Flow Rate Units	31	Set to g/m or GPM
Default Settings†	**26**	**1. Solidify Settings**
View Data	00	To obtain flow readings

* Standard pipe materials and standard liquids refer to those with the sound parameters that have already been programmed into the flow meter software. Non standard pipe materials and non standard liquids will need the sound speed configured.

† You must store the settings when completed or the unit will reset to default settings upon startup

Section 4: Fine Tuning and Troubleshooting

4.1   Setting Your Zero Point
If possible, stop all flow running through the pipe while maintaining a pipe full of liquid.

Parameter	Menu Screen	Note
Set Zero	42	Zero calibration/Zero Point Setup

4.2   Fine Tuning
For the flow meter readings to be considered accurate, you must confirm the data in two menu screens.

Parameter	Menu Screen	Note
Signal Strength + Quality	90	Poor <60 **Optimal 60-99** Poor >90
Transit Time Ratio	91	100% +/-3%

Tips:

- If necessary, move transducers closer to, or further from, each other to increase or decrease the values in screen 91
- Make sure the transducer mounting area on the pipe is coating free and smooth.

4.3   Manual Totalizer Reset
Should you want to reset the totalizer values you can do so in Menu 37. You can use a calibration totalizer on Menu 38.

Parameter	Menu Screen	Note
Totalizer Reset	37	Reset All
Manual Totalizer	38	Use for manual calibration of flow

4.4   Troubleshooting

If you are unable to get a flow reading, or if your values in screens 90 and 91 are not within their thresholds:

- Is the pipe too old?
- Too much corrosion?
- Too many air bubbles?
- Is the pipe full?
- Are your parameters correct?
- Are the transducers located too close to the pump, valve or elbow in the pipe?
- Is the transducer spacing correct (menu screen 24)

Appendix A: Menu Screens

Menu window No.	Function
M00	Display flow rate and NET totalizer If the net totalizer is turned off, the net totalizer value shown on the screen is the value prior to its turn off Select all totalizer unit in menu M31
M01	Display flow rate, velocity
M02	Display date time and POS(positive) totalizer If the positive totalizer is turned off, the positive totalizer value shown on the screen is the value prior to its turn off
M03	Display flow rate and NEG(negative) totalizer If the negative totalizer is turned off, the negative totalizer value shown on the screen is the value prior to its turn off
M04	Display date and time, flow rate. The date and time setting method is found in MENU60
M05	Display energy rate(instantaneous Caloric)and total energy (Caloric)
M06	Display temperatures, inlet T1, outlet T2
M07	Display analog inputs, AI3/AI4, current value and its corresponding temperature or pressure or liquid level value
M08	Display all the detailed error codes Display working condition and system error codes. 'R' stands for normal, others refer to Chapter 8 for details.
M09	Display today's total NET flow
M10	Window for entering the outer perimeter of the pipe. If pipe outer diameter is known, skip this menu and go to Menu 11 to enter the outer diameter

M11	Window for entering the outer diameter of the pipe. Valid range:0 to 18000mm. Note: you just need to enter either the outer diameter in M11 or the peripheral in M10
M12	Window for entering pipe wall thickness You may skip the menu and enter inner diameter in M13 instead.
M13	Window for entering the inner diameter of the pipe If pipe outer diameter and wall thickness are enter correctly, the inner diameter will be calculated automatically, thus no need to change anything in the window
M14	Window for selecting pipe material Standard pipe materials (no need to enter material sound speed) include: (0) carbon steel (1) stainless steel (2) cast iron (3) ductile iron (4) copper (5) PVC (6) aluminum (7) asbestos (8) fiberglass (9) other(need to enter material sound speed in M15)
M15	Window for entering the pipe material speed, only for non-standard pipe materials
M16	Window for selecting the liner material, select none for pipes without any liner. Standard liner materials(no need to enter the liner sound speed) include: (1) Tar Epoxy (2) Rubber (3) Mortar (4) Polypropylene (5) Polystryol (6)Polystyrene (7) Polyester (8) Polyethylene (9) Ebonite (10) Teflon (11) Other (need to enter liner sound speed in M17)
M17	Window for entering the non-standard liner material speed.
M18	Window for entering the liner thickness, if there is a liner
M19	Window for entering the ABS thickness of the inside wall of the pipe
M20	Window for selecting fluid type For standard liquids(no need to enter fluid sound speed) include: (0) Water (1) Sea Water (2) Kerosene

	(3) Gasoline (4) Fuel oil (5) Crude Oil (6) Propane at -45C (7) Butane at 0C (8)Other liquids(need to enter sound speed in M21 and viscosity in M22) (9) Diesel Oil (10)Caster Oil (11)Peanut Oil (12) #90 Gasoline (13) #93 Gasoline (14) Alcohol (15) Hot water at 125C
M21	Window for entering the sound speed of non- standard liquid, used only when option item 8 'Other' is selected in M20
M22	Window for entering the viscosity of the non-standard liquids, used only when option item 8 'Other' is selected in M20
M23	Window for selecting transducer type, There are 22 types as following 0. Standard M 1. Insertion Type C 2. Standard S 3. User Type 4. Standard B 5. Insertion Type B(45) 6. Standrad L 7. JH-Polysonics 8. Standard-HS 9. Standard-HM 10. Standard-M1 (middle M1 transducer) 11. Standard-S1 (small S1 transducer) 12. Standard-L1 (large L1 transducer) 13. PI-Type 14. FS410 15. FS510 16. Clamp-on TM-1 17. Insertion TC-1 18. Calmp-on TS-1 19. Reserved 20. Clamp-on TL-1

	21. Insertion TLC-2 If the user-type-transducer is selected, you need enter additional 4 user-type-wedge parameters that describe the user transducers. If the PI-type transducer is selected, you need enter additional 4 PI-type transducer parameters that describe the PI-type transducers
M24	Window for selecting the transducer mounting methods Four methods can be selected: (0) V-method (1) Z-method (2) N-method (3) W-method
M25	Display the transducer mounting spacing or distance
M26	(1) A switch for the parameters in flash memory will be loaded when power is turned on. The default option is that the parameters will be loaded. If this switch is not turned on, the system will try to use the parameters in the system RAM, if these parameters are ok, otherwise the system will load the parameters in flash memory (2) Function to store the current parameters into the flash memory, so that these parameters will be solidified and will be loaded as the default parameters every time when power is turned on.
M27	Entry to store to or restore from the internal Flash memory, as many as 9 different pipe parameter configurations To save or load the current setup parameter, use the going up or going down keys to change the address number, press 'ENT' key, and use going down or going up keys to select to save to or load from the memory.
M28	Entry to determine whether or not to hold (or to keep) the last good value when poor signal condition occurs. YES is the default setup.
M29	Entry to setup empty signal threshold. When the signal is less than this threshold, the pipe is regarded as empty pipe, and the flow meter will not totalize flow. This is based on the fact that, for most occasions, when pipe is empty, the transducer would still receive signal, just smaller than normal, As a result, The flow meter would show normal operation, which is not correct. Make sure that the entered value must be less than the normal signal strength. When much noisy signals are received, to make sure the flow meter will not incorrectly

	totalize flow, there is also a 'Q' threshold should be entered in M.5
M30	Window for selecting unit system. The conversion English to Metric or vice versa will not affect the unit for totalizers.
M31	Window for selecting flow rate unit system. Flow rate can be in 0. Cubic meter short for (m^3) 1. Liter (l) 2. USA gallon (gal) 3. Imperial Gallon (igl) 4. Million USA gallon (mgl) 5. Cubic feet (cf) 6. USA liquid barrel (bal) 7. Oil barrel (ob) The flow unit in terms of time can be per day, per hour, per minute or per second. So there are 32 different flow rate units in total for selection.
M32	Window for selecting the totalizers unit. Available units are the same as those in M31
M33	Window for setting the totalizer multiplying factor The multiplying factor ranges from 0.001 to 10000. Factory default is 1
M34	Turn on or turn off the NET totalizer
M35	Turn on or turn off the POS (positive) totalizer
M36	Turn on or turn off the NEG(negative) totalizer
M37	(1) Totalizer reset (2) Restore the factory default settings parameters. Press the dot key followed by the backspace key. Attention, It is recommended to make note on the parameters before doing the restoration
M38	Manual totalizer used for easier calibration. Press a key to start and press a key to stop the manual totalizer.

M39	Interface Language selection. The selection could also be changed automatically by the system, if English LCD display is used as the display device.
M40	Flow rate damper for a stable value. The damping parameter ranges form 0 to 999 seconds. 0 means there is no damping. Factory default is 10 seconds
M41	Low flow rate (or zero flow rate) cut-off to avoid invalid accumulation.
M42	Zero calibration/Zero point setup. Make sure the liquid in the pipe is not running while doing the setup.
M43	Clear the zero point value, and restore the solidified zero point value.
M44	Set up a flow bias. Generally this value should be 0.
M45	Flow rate scale factor. The default value is '1'. Keep this value as '1', when no calibration has been made.
M46	Networks address identification number. Any integer can be entered except 13(0DH, carriage return), 10 (0AH, line feeding), 42 (2AH), 38, 65535. Every set of the instrument in a network environment should have a unique IDN. Please refer to the chapter for communication.
M47	System locker to avoid modification of the system parameters. If password is forgotten, you could send a command 'LOCK0' to the serial input to unlock. Or you can write 0 to REGISTER49-50 under MODBUS protocol.
M48	Entry to linearity correcting data inputs. By using of this function, the non-linearity of flow meter will be corrected. Correcting data shall be obtained by careful calibration.
M49	Displays the input contents for the serial port. By checking the displays, you can know if the communication is ok.
M50	Switches for the built-in data logger. There are as many as 22 different items can be chosen. To turn this function, select 'YES' the system will ask for selecting the items.

	There are 22 items available. Turn on all those items you want to output
M51	Window to setup the time of scheduled output function (data logger, or Thermo-printer). This includes start time, time interval and how many times of output. When a number great than 8000 entered for the times of output, It means the output will be keeping always. The minimum time interval is 1 second and the maximum is 24 hours.
M52	Data logging direction control. (1) If 'Send to RS485' is selected, all the data produced by the data logger will be transmitted out through the RS-232/RS485 interface (2) If 'To the internal serial BUS is selected, the data will be transmitted to the internal serial bus which allows a thermal printer, or a 4-20mA analog output module, to be connected to it.
M53	Display analog inputs, AI5, current value and its corresponding temperature or pressure or liquid level value.
M54	Pulse width setup for the OCT (OCT1) output. Minimum is 6 mS, maximum is 1000 mS
M55	Select analog output (4-20mA current loop, or CL) mode. Available options: (0) 4-20mA output mode (setup the output range from 4-20mA) (1) 0-20mA output mode (setup the output range from 4-20mA, This mode can only be used with Version-15 flow meter) (2) Serial port controls 0-20mA (3) 4-20mA corresponding fluid sound speed (4) 20-4-20mA mode (5) 0-4-20mA mode (can only be used with Version-15 flow meter) (6)20-0-20mA mode(can only be used with Version-15 flow meter) (7) 4-20mA corresponding flow velocity (8)4-20mA corresponding heat flow rate
M56	4mA or 0mA output value, Set the value which corresponds to 4mA or 0mA output current (4mA or 0mA is

	determined by the setting in M55)
M57	20mA output value, Set the value which corresponds to 20mA output current
M58	Current loop verification Check if the current loop is calibrated correctly.
M59	Display the present output current of current loop circuit.
M60	Setup system date and time. Press ENT for modification. Use the dot key to skip the digits that need no modification.
M61	Display Version information and Electronic Serial Number (ESN) that is unique for each flow meter. The users may employ the ESN for instrumentation management
M62	RS-232/RS485 setup. All the devices connected with flow meter should have matched serial configuration. The following parameters can be configured: Baud rate (300 to 19200 bps), parity, data bits (always is 8), stop bits
M63	Select communication protocol. Factory default is 'MODBUS ASCII. this is a mode for MODBUS-ASCII, Meter-BUS, Fuji Extended Protocol If you are going using MODBUS-RTU you have to select 'MODBUS_RTU'.
M64	AI3 value range. Used to enter temperature/pressure values that are corresponding to 4mA and 20mA input current. The display values have no unit, so that they can present any physical parameter.
M65	AI4 value range. Used to enter temperature/pressure values that are corresponding to 4mA and 20mA input current.

M66	AI5 value range. Used to enter temperature/pressure values that are corresponding to 4mA and 20mA input current.
M67	Windows to setup the frequency range (lower and upper limit) for the frequency output function. Valid range is 0Hz-9999Hz. Factory default value is 0-1000 Hz. For Version-12, Version-13, Version-14 flow meters, you need a hardware module, which shall be plugged to the Serial Expanding Bus, for the frequency output function. Please remember to order the module if you need frequency output function. For Version-15 flow meter, you need to indicate on your orders that you need the frequency function; Otherwise you will get a flow meter which has no frequency output circuits.
M68	Window to setup the minimum flow rate value which corresponds to the lower frequency limit of the frequency output.
M69	Windows to setup the maximum flow Rate value that corresponds to the upper frequency limit of the frequency output.
M70	LCD display backlight control. The entered value indicates how many seconds the backlight will be on with every key pressing. If the enter value is great than 50000 seconds, It means that the backlight will always keeping on.
M71	LCD contrast control. The LCD will become darker or brighter when a value is entered.
M72	Working timer. It can be cleared by pressing ENT key, and then select YES.
M73	Window to setup the lower limit of flow rate for Alarm#1. When the flow rate is below the set value, Alarm#1 equals 'on'
M74	Window to setup the upper limit of flow rate for Alarm#1. When the flow rate is above the set value, Alarm#1 equals 'on' There are two alarms in the flow meter, and every alarm can be pointed to alarm output devices such as the BUZZER or OCT output or RELAY output. For example, if you want the Alarm#1 is to output by the OCT circuit, you need to set M78 at selection item 6.
M75	Window to setup the lower limit of flow rate for Alarm#2.

M76	Window to setup the upper limit of flow rate for Alarm#2.
M77	Buzzer setup. If a proper input source is selected, the buzzer will beep when the trigger event occurs. The available trigger sources are: 0. No Signal 1. Poor Signal 2. Not Ready (No*R) 3. Reverse Flow 4. AO Over 100% 5. FO Over 120% 6. Alarm #1 7. Reverse Alarm #2 8. Batch Control 9. POS Int Pulse 10.NEG Int Pulse 11.NET Int Pulse 12.Energy POS Pulse 13.Energy NEG Pulse 14.Energy NET Pulse 15.MediaVel=>Thresh 16.MediaVelo<Thresh 17.ON/OFF viaRS232 18.Daily Timer (M51) 19.Timed alarm #1 20. Timed alarm #2 21.Batch Totalizer Full 22. M51 Timer 23. Key Stroking ON 24.Disable BEEPER
M78	OCT (Open Collect Transistor Output)/OCT1 setup By selecting a proper input source, the OCT circuit will close when the trigger event occurs. The available trigger sources are: 0. No Signal 1. Poor Signal 2. Not Ready(No*R) 3. Reverse Flow 4. AO Over 100% 5. FO Over 120% 6. Alarm #1 7. Reverse Alarm #2 8. Batch Control 9. POS Int Pulse 10.NEG Int Pulse 11.NET Int Pulse 12.Energy POS Pulse 13.Energy NEG Pulse 14.Energy NET Pulse 15.MediaVel=>Thresh 16.MediaVelo<Thresh 17.ON/OFF viaRS232 18. Daily Timer (M51) 19.Timed alarm #1 20. Timed alarm #2 21.Batch Totalizer Full 22. Periodically M51 Timer 23. Oct Not Using

	The OCT circuit does not source voltage at its output. It must be connected with an external power and pull-up resistant for some occasions.

When the OCT circuit is close, it will draw current. The maximum current shall not be over 100mA.

Attention: the maximum voltage applied to OCT can not be over 80 volts. |
| M79 | Relay or OCT2 setup

By selecting a proper input source, the RELAY will close when the trigger event occurs

The available trigger sources are:

0. No Signal   1. Poor Signal

2. Not Ready(No*R) 3. Reverse Flow   4. AO Over 100%

5. FO Over 120%   6. Alarm #1   7. Reverse Alarm #2

8. Batch Control   9. POS Int Pulse   10.NEG Int Pulse

11.NET Int Pulse   12.Energy POS Pulse 13.Energy NEG Pulse

14.Energy NET Pulse 15.MediaVel=>Thresh 16.MediaVelo<Thresh

17.ON/OFF viaRS232 18. Timer (M51 Daily) 19.Timed alarm #1

20. Timed alarm #2   21.Batch Totalizer Full

22. Periodically M51 Timer 23. Disable Relay

The RELAY is of SPST(Single pole, single throw) type. It is rated for 110VAC max and have a current rating of 0.5A resistive load.

It highly recommended that a salve relay to be utilized whenever a large resistive load or inductive load is to be controlled.

Note. In order to make the user interface compatible with the former version7, the name RELAY was used other than OCT2, but in fact it is an OCT output. |
| M80 | Window for selecting the trig signal for the built-in batch controller. Available trig sources:

0. Key input   (press ENT key to start the batch controller)

1. Serial port |

	2. AI3 rising edge (when AI3 receives 2mA or more current)
	3. AI3 falling edge (when AI3 stop receiving 2mA or more current)
	4. AI4 rising edge (when AI3 receives 2mA or more current)
	5. AI4 falling edge (when AI3 stop receiving 2mA or more current)
	6. AI5 rising edge (when AI3 receives 2mA or more current)
	7. AI5 falling edge (when AI3 stop receiving 2mA or more current)
	8.Timer periodically (define the start time and interval time in M51)
	9.Timer daily (define the start time and interval time in M51)
	For the input analog current signal, 0 mA indicates "0", 4mA or more indicates '1'.
	By selecting item #8, the batch totalizer can be started periodically by the internal timer located at Menu51. When the batch totalizer is full, a signal which indicate the batch is full can be direct to either the OCT or the RELAY terminals to stop the pump or other devices.
	By selecting item #9, the batch totalizer could act as totalizer which runs for only a period of the day so that a alarm signal could be produced if the total flow during that time period is over a certain amount of. For example, if you want a alarm signal which stand for the total flow is over 100 cubic meters during the period of every day from 20:00 to 06:00, setups is like
	M51 start time =20:00:00
	M51 interval =10:00:00
	M51 log times =9999 (means always)
	M80 select item #9
	M81 input 100 (Unit is defined in M30,M31,M32)
M81	The built-in batch controller
	Set the flow batch value(dose)
	The internal output of the batch controller can be directed either to the OCT or the RELAY output circuits.
	M81 and M80 should be used together to configure the batch controller.

	Note: Because the measuring period is 500mS, the flow for every dos should be keeping at 60 seconds long to get a 1% dose accuracy.
M82	View the daily, monthly and yearly flow totalizer and thermal energy totalizer value. The totalizer values and errors for the last 64 days, 32 last 32 months and last 2 years are stored in the RAM memory, To view them, use the 'ENT' and 'UP' 'Down' keys.
M83	Automatic Amending Function for automatic offline compensation. Select 'YES' to enable this function, select 'NO' to disable it. When the function is enabled, The flow meter will estimate the average flow uncounted (or 'lost') during the offline session and add the result to the totalizer. The estimation of the uncounted flow is made by computing the product of the offline time period and the average flow rate, which is the average of the flow rate before going offline and the one after going on line.
M84	Set the thermal energy unit: 0. GJ 1. KC 2.KWh 3. BTU
M85	Select temperature sources 0. from T1,T2 (factory default) 1. from AI3,AI4
M86	Select the Specific Heat Value. Factory default is 'GB'. Under this setting, the flow meter will calculate the enthalpy of water based on the international standard. If the fluid is other than water, you should select option '1. Fixed Specific Heat', and enter the specific heat value of the fluid.
M87	Turn on or turn off the Energy totalizer.
M88	Select thermal energy totalizer multiplying factor. Factory default is '1'.
M89	1. Display the temperature difference

	2. Window for entering the lowest temperature difference.
M90	Display signal strengths S (one for upstream and one for downstream), and signal quality Q value. Signal strength is presented by 00.0 to 99.9, the bigger the value, the bigger the signal strength will be, and more reliable readings will be made. Q value is presented by 00 to 99, the bigger the better. It should at least be great than 50 for normal operations.
M91	Displays the Time Ratio between the Measured Total Transit Time and the Calculated time. If the pipe parameters are entered correctly and the transducers are properly installed, the ratio value should be in the range of 100±3%. Otherwise the entered parameters and the transducer installation should be checked.
M92	Displays the estimated fluid sound velocity. If this value has an obvious difference with the actual fluid sound speed, pipe parameters entered and the transducer installation should be checked again.
M93	Displays total transit time and delta time(transit time difference)
M94	Displays the Reynolds number and the pipe factor used by the flow rate measurement program. Pipe factor is calculated based on the ratio of the line-average velocity and the cross-section average velocity.
M95	(1) Display the positive and negative energy totalizers (2) Upon entering this window, the circular display function will be started automatically. The following windows will be displayed one by one, each window will stay for 8 seconds: M95>>M00>>M01>>M02>>M02>> M03>>M04>>M05>>M06>>M07>>M08>>M90>>M91>>M92>> M93>> M94>>M95. This function allows the user to visit all the important information without any manual action. To stop this function, simply press a key. Or switch to a window other than M95.
M96	This is not a window but a command for the thermal printer to advance 5 lines of paper.
M97	This is not a window but a command to print the pipe parameters. By default, the produced data will be directed to the internal serial bus (thermal printer). You can also direct those data to the serial communication port.

M98	This is not a window but a command to print the diagnostic information.
	By default, the produced data will be directed to the internal serial bus (thermal printer). You can also direct those data to the serial communication port.
M99	This is not a window but a command to copy the current display window. By default, the produced data will be directed to the internal serial bus (thermal printer). You can also direct those data to the serial communication port.
	By use of the window copying function, you can hardcopy very window displaying manually by switching windows, or you can obtain the window displaying data by communication.
M+0	Browse the 32 recorded instrument power-on and power-off date and time with the flow rate at the time of power on and off
M+1	Displays the total working time of the flow meter.
	When the backup battery is removed, the total working time will be reset to zero.
M+2	Displays the last power-off date and time
M+3	Displays the last power-off flow rate
M+4	Displays how many times of has been powered on and powered off.
M+5	A scientific calculator for the convenience of field working.
	All the values are in single accuracy.
	The calculator can be used while the flow meter is conducting flow measurement.
	Water density and PT100 temperature can also be found in this function.
M+6	Set fluid sound speed threshold
	Whenever the estimated sound speed (displayed in M92) exceeds this threshold, an alarms signal will be generated and can transmitted to BUZZER or OCT or RELAY.
	This function can used to produce an alarm or output when fluid material changes.
M+7	Displays total flow for this month(only for the time past)
M+8	Displays total flow for this year(only for the time past)

M+9	Display the not-working total time in seconds. The total failure timer will also include the time when power off, if the back-up battery is applied.
M.2	Entry to solidify the zero point. Password protected.
M.5	Setup the Q value threshold. If the present Q is below this threshold, flow rate will be set to 0. This function is useful when flow meter is installed in noisy environment or on airy pipes.
M.8	The maximum flow rates for today and this month.
M.9	Serial port tester with CMM command output for very second.
M-0	Entry to hardware adjusting windows only for the manufacturer
M-1	4-20mA output adjustment
M-2	4mA calibration for AI3 input
M-3	20mA calibration for AI3 input
M-4	4mA calibration for AI4 input
M-5	20mA calibration for AI4 input
M-6	4mA calibration for AI5 input
M-7	20mA calibration for AI5 input
M-8	Lower Temperature Zero setup for the PT100
M-9	Higher Temperature Zero setup for the PT100
M-A	Temperature Calibration at 50℃
M-B	Temperature Calibration at 84.5℃

Section	Revisions	Date
Doc	Revised entire document, condensing and repositioning sections	5-28-13
Doc	Added Kit Includes	5-28-13
4.2	Added Zero Flow Calibration	6-14-13
4.3	Added instruction for totalizer reset	6-14-13

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